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In situ magnetism study of monolayer-regime Co films using three-configurational magneto-optical Kerr effects

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We present a novel method to determine all the components of magnetization vector in ultrathin ferromagnetic films using magneto-optical Kerr effects of either both p- and s-polarization waves or each polarization wave. The technique has been applied to *in situ* study of magnetization reversal and spin-reorientation transition (SRT) in Co films grown on Pt(111) single-crystal substrate. The thickness-driven SRT from perpendicular to in-plane magnetization in Co/Pt(111) occurs in the film thickness range of 10~15 monolayer. This transition proceeds via a stable state of the canted phase exhibiting a typical second-order behavior. The 2^{nd}- and 4^{th}-order anisotropy constants are determined from the experimental canted angle: K_{2s} = 1.8 mJ/m^{2}and K_{4s} = -0.034 mJ/m^2. The large 2^{nd}-order surface anisotropy is interpreted to be responsible for the later onset of transition, while the small 4^{th}-order surface anisotropy results in a stable canted phase during SRT.

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